Practitioner's Docket No. 508-042.9

CHAPTER II

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P., § 601, 7th ed.

TRANSMITTAL LETTER TO THE UNITED STATES ELECTED OFFICE (EO/US)

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

PCT/GB00/02224	8 June 2000	18 June 2000
INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED

Bridge Joint
TITLE OF INVENTION

Michael J. BURA and Seamus M. DEVLIN
APPLICANT(S)

BOX PCT
U.S. PATENT AND TRADEMARK OFFICE
P.O. BOX 2327
ARLINGTON, VA 22202
ATTN: EO/US

CERTIFICATION UNDER 37 C.F.R. § 1.10*
*(Express Mail label number is **mandatory**.)*
(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date December 17, 2001, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EV005523914UD, addressed to the: Assistant Commissioner for Patents, Arlington, VA 22202

Judith Schick
(type or print name of person mailing paper)

Judith Schick
Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1 495.

WARNING: *Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R § 1.8.*

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1 494(f).

I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:

a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).

b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

10/018621
JC13 Rec'd PCT/PTO 17 DEC 2001

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
☐*	TOTAL CLAIMS 11	-20=		× $18.00=	$ 0
	INDEPENDENT CLAIMS 1	-3=		× 84.00	
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ 280.00	
BASIC FEE**	☐ U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: ☐ and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) ..... 100 ☐ and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) ..... 710 ☒ U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: ☐ has been paid (37 C.F.R. § 1.492(a)(2)) ..... 740 ☐ has not been paid (37 C.F.R. § 1.492(a)(3)) ..... 1040 ☒ where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) 890				890.00
	Total of above Calculations				= 890.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 C.F.R. § 1.9, 1.27, 1.28) As claimed.				- 445.00
	Subtotal				$ 445.00
	Total National Fee				$ 445.00
	Fee for recording the enclosed assignment document $40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				$ 445.00

*See attached Preliminary Amendment Reducing the Number of Claims.

i. ☒ A check in the amount of $445.00 to cover the above fees is enclosed.

ii. ☐ Please charge Account No. _____ in the amount of $ _____. A duplicate copy of this sheet is enclosed.

**WARNING: *"To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).*

WARNING: *If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.*

3. ☒ A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: *Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.*

a. ☐ is transmitted herewith.

b. ☐ is not required, as the application was filed with the United States Receiving Office.

c. ☒ has been transmitted

i. ☒ by the International Bureau.
Date of mailing of the application (from form PCT/1B/308): _____.

ii. ☐ by applicant on _____.
Date

4. ☒ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

a. ☐ is transmitted herewith.

b. ☒ is not required as the application was filed in English.

c. ☐ was previously transmitted by applicant on _____.
Date

d. ☐ will follow.

5. ☐ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: *The Notice of January 7, 1993 points out that 37 C.F.R § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.*

a. ☐ are transmitted herewith.

b. ☐ have been transmitted

i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308): _____.

ii. ☐ by applicant on (date) _____.
Date

c. ☐ have not been transmitted as

i. ☐ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.): _____.

ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☐ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

a. ☐ is transmitted herewith.

b. ☐ is not required as the amendments were made in the English language.

c. ☐ has not been transmitted for reasons indicated at point 5(c) above.

7. ☐ A copy of the international examination report (PCT/IPEA/409)

☐ is transmitted herewith.

☐ is not required as the application was filed with the United States Receiving Office.

8. ☐ Annex(es) to the international preliminary examination report

a. ☐ is/are transmitted herewith.

b. ☐ is/are not required as the application was filed with the United States Receiving Office.

9. ☐ A translation of the annexes to the international preliminary examination report

a. ☐ is transmitted herewith.

b. ☐ is not required as the annexes are in the English language.

10/018621

17 DEC 2001

10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

a. ☐ was previously submitted by applicant on ________.
Date

b. ☐ is submitted herewith, and such oath or declaration

i. ☐ is attached to the application.

ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.

c. ☒ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

a. ☐ is transmitted herewith.

b. ☒ has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): ________.

c. ☐ is not required, as the application was searched by the United States International Searching Authority.

d. ☐ will be transmitted promptly upon request.

e. ☐ has been submitted by applicant on ________.
Date

12. ☒ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

a. ☐ is transmitted herewith.

Also transmitted herewith is/are:

☐ Form PTO-1449 (PTO/SB/08A and 08B).

☐ Copies of citations listed.

b. ☒ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).

c. ☐ was previously submitted by applicant on ________.
Date

13. ☐ An assignment document is transmitted herewith for recording.

A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

____

____

____

14. ☒ Additional documents:
   a. ☐ Copy of request (PCT/RO/101)
   b. ☒ International Publication No. WO 00/79055
      i. ☒ Specification, claims and drawing
      ii. ☐ Front page only
   c. ☒ Preliminary amendment (37 C.F.R. § 1.121)
   d. ☐ Other

15. ☒ The above checked items are being transmitted
   a. ☒ before 30 months from any claimed priority date.
   b. ☐ after 30 months.

16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on ____________, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: *Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.*

NOTE: *"A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).*

NOTE: *"Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).*

☒ The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 23-0442.

☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: *Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.*

☐ 37 C.F.R. §. 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

☐ 37 C.F.R. § 1.17 (application processing fees)

☐ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

☐ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

SIGNATURE OF PRACTITIONER

Reg. No.: 27,550

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Customer No.: 004955

Alfred A. Fressola
(type or print name of practitioner)

Ware, Fressola, Van Der Sluys & Adolphson LLP

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Monroe, CT 06468

PATENT
508-042.8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the matter of: Bura et al	)	
	)	
Serial No:	)	Group Art Unit
	)	
International Application: PCT/GB00/02224	)	
	)	
International Filing Date: December 28, 2000	)	
	)	Examiner:
Filed: Herewith	)	
	)	
For: Bridge Joint	)	

ASSISTANT COMMISSIONER OF PATENTS
WASHINGTON, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Please preliminarily amend the above-referenced application as follows:

In the Specification:

Prior to line 3 of page 1, please insert a new heading as follows:

--Technical Field--

Prior to line 6 of page 1, please insert a new heading as follows:

--Background of the Invention--.

Express Mail No. EV 005523914 US

Please replace the paragraph beginning at line 6 of page 1 with the following rewritten paragraph:

--Bridge joints are required primarily because of thermal expansion and contraction in the roadway of a bridge. Also they accommodate initial contraction on setting of concrete in the roadway and relative shear and rise/fall of adjacent roadway sections.--

Prior to line 11 of page 1, please insert a new heading as follows:

--Summary of the Invention--.

Please replace the paragraph beginning at line 5 of page 2 with the following rewritten paragraph:

--Preferably, the support formations are open, circular section grooves; and the crossbeams have spherical ends which fit into the grooves. The grooves may be supplemented by support lips abutting the underside of the crossbeams, particularly where the edge beams are not expected to rise and fall with respect to each other.--

Prior to line 17 of page 2, please insert a new heading as follows:

--Brief Description of the Drawings--.

Prior to line 23 of page 2, please insert a new heading as follows:

--Best Mode for Carrying Out the Invention--.

Please replace the paragraph beginning at line 9 of page 3 with the following rewritten paragraph:

--The crossbeams support a number, three as shown, of intermediate roadway beams 20. They are of general I-beams shape, with small grooves 21 in their heads 22. The edge flanges 8 of the edge beams also have such small grooves 21. Via these small grooves a diaphragm seal 23 is connected between each adjacent pair of roadway beams. These seals exclude water and dirt from the parts of the joint beneath them. The heads of the roadway beams provide the roadway surface between the concrete of the roadway sections 2, 3. Feet 24 of the intermediate beams rest on the crossbeams. These transfer road loads to the edge beams via the balls 14 and lips 16 at the lower side of the mouth of the grooves 9.--

In the Claims:

Claim 1 has been amended. Claims 3 - 12 have been cancelled. Claims 13 - 21 have been added.

1. (Amended) A bridge joint for joining two sections of a roadway of a bridge, the bridge joint comprising:

. a plurality of roadway beams extending across the roadway and including;

- opposite edge beams having support formations extending therealong, the edge beams being adapted to be fixed to respective opposite ones of the roadway sections and
- intermediate beams;

a plurality of crossbeams extending between the opposite edge beams,

- the crossbeams having end formations which are complementary to the support formations of the edge beams,
- the crossbeams being supported by engagement of the end formations with the support formations, whereby the crossbeams remain mutually parallel as the edge beams move with respect to each other, at least whilst the edge beams remain parallel and
- the crossbeams and the intermediate beams being adapted for support of the intermediate beams on the crossbeams; and

spacing features fixed on at least some of the crossbeams and co-operating with the intermediate beams for evenly spacing the latter between the edge beams

characterised in that the support formations of the opposite edge beams are open, circular section grooves; and the end formations of the crossbeams have spherical ends, sized to fit the grooves.

13. (Added) A bridge joint as claimed in claim 1, including a number of spacer balls arranged in each groove between each adjacent pair of crossbeam spherical ends to maintain the separation of the crossbeams.

14. (Added) A bridge joint as claimed in claim 1, wherein the support formations include support lips along the edges of the edge beams, with the circular grooves being set in from the support lips, and the crossbeams have flat undersides bearing on the support lips.

15. (Added) A bridge joint as claimed in claim 1, wherein the intermediate beams are perforate, with the crossbeams passing through perforations in the intermediate beams.

16. (Added) A bridge joint as claimed in claim 15, wherein the intermediate beams have flat under-surfaces for bearing on the crossbeams and lower extensions including the perforations, and the crossbeams have flat topsides for supporting the under-surfaces of the intermediate beams.

17. (Added) A bridge joint as claimed in claim 1, wherein the spacing features are cams fixed to the crossbeams and acting on the intermediate beams.

18. (Added) A bridge joint as claimed in claim 17, wherein the spacing features are cams fixed to the undersides of at least some of the crossbeams and acting on respective opposite faces of the lower extensions of the intermediate beams.

19. (Added) A bridge joint as claimed in claim 1, wherein the edge beams and the intermediate beams have heads with laterally opening grooves, diaphragm seals engaged in these grooves extending between respective adjacent pairs of these beams.

20. (Added) A bridge joint as claimed in claim 1, wherein the edge beams and the intermediate beams are solid steel beams and the crossbeams are of tubular steel.

21. (Added) A bridge joint as claimed in claim 20, wherein the crossbeams are of mild steel, with stainless steel sheaths.

In the Abstract:

After claim page 5, please insert a new page with the following:

--Abstract of the Disclosure

A bridge joint (1) has steel edge beams (4, 5) arranged at the edges of concrete (C) roadway sections. Each edge beam has a circular cross section groove (9), which opens towards the gap (G) between the roadway sections and the opposite edge beam. Crossbeams (10) are regularly spaced across the width of the roadway. To each end of the crossbeams, a spherical steel ball (14) is fixed, sized to fit in the groove (9). The crossbeams support a number of intermediate roadway beams (20). They are of general I-beam shape, with small grooves (21) in their heads (22) as do the edge flanges (8) of the edge beams. Via these small grooves a diaphragm seal (23) is connected between each adjacent pair of roadway beams. Feet (24) of the intermediate beams rest on the cross beams to transfer road loads to the edge beams via the balls (14) and lips (16) at the lower side of the mouth of the grooves (9).--

Remarks

This preliminary amendment is filed for the purpose of placing the application into standard U.S. format. Consideration and allowance of the claims is earnestly solicited.

Claim 1 has been amended. Claims 3 - 12 have been cancelled and claims 13 - 21 have been added.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **"Version with markings to show changes made".**

Respectfully submitted,

Date: 12/17/01

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& Adolphson LLP
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(203) 261-1234

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Paragraph beginning at line 6 of page 1 has been amended as follows:

Bridge joints are required primarily because of thermal expansion and contraction in the roadway of a bridge. Also they accommodate initial [contract] contraction on setting of concrete in the roadway and relative shear and rise/fall of adjacent roadway sections.

Paragraph beginning at line 5 of page 2 has been amended as follows:

Preferably, the support formations are open, circular section grooves; and the crossbeams have spherical ends which fit into the grooves. The grooves may be supplemented by support lips abutting the underside of the crossbeams, particularly where the edge beams are not expected to rise and fall with respect to each other.

Paragraph beginning at line 9 of page 3 has been amended as follows:

The crossbeams support a number, three as shown, of intermediate roadway beams 20. They are of general I-beams shape, with small grooves 21 in their heads 22. The edge flanges 8 of the edge beams also have such small grooves 21. Via these small grooves a diaphragm seal 23 is connected between each adjacent pair of roadway beams. These seals exclude water and dirt from the parts of the joint beneath them. The heads of the roadway beams

provide the roadway surface between the concrete of the roadway sections 2, 3. Feet 24 of the intermediate beams rest on the crossbeams. These transfer road loads to the edge beams via the balls 14 and lips 16 at the lower side of the mouth of the grooves 9.

In the Claims:

Claim 1 has been amended.

Please cancel claims 3 - 12 have been cancelled. Claims 13 - 21 have been added.

1. (Amended) A bridge joint for joining two sections of a roadway of a bridge, the bridge joint comprising:

. a plurality of roadway beams extending [laterally of] across the roadway and including;

. opposite edge beams having support formations extending therealong, the edge beams being adapted to be fixed to respective opposite ones of the roadway sections and

. intermediate beams;

. a plurality of crossbeams extending between the opposite edge beams,

. the crossbeams having end formations which are complementary to the support formations of the edge beams,

the crossbeams being supported by engagement of the end formations with the support formations, whereby the crossbeams remain mutually parallel as the edge beams move with respect to each other, at least whilst the edge beams remain parallel and

the crossbeams and the intermediate beams being adapted for support of the intermediate beams on the crossbeams; and

spacing features fixed on at least some of the crossbeams and co-operating with the intermediate beams for evenly spacing the latter between the edge beams

characterised in that the support formations of the opposite edge beams are open, circular section grooves; and the end formations of the crossbeams have spherical ends, sized to fit the grooves.

BRIDGE JOINT

The present invention relates to a bridge joint, that is to say a joint between two sections of the roadway of a bridge.

Bridge joints are required primarily because of thermal expansion and contraction in the roadway of a bridge. Also they accommodate initial contract on setting of concrete in the roadway and relative shear and rise/fall of adjacent roadway sections.

The object of the present invention is to provide an improved bridge joint.

According to the present invention there is provided a bridge joint for joining two sections of a roadway of a bridge, the bridge joint comprising:

- a plurality of roadway beams extending across the roadway and including:
  - opposite edge beams having support formations extending therealong, the edge beams being adapted to be fixed to respective opposite ones of the roadway sections and
  - intermediate beams;
- a plurality of crossbeams extending between the opposite edge beams,
  - the crossbeams having end formations which are complementary to the support formations of the edge beams,
  - the crossbeams being supported by engagement of the end formations with the support formations, whereby the crossbeams remain mutually parallel as the edge beams move with respect to each other, at least whilst the edge beams remain parallel and
  - the crossbeams and the intermediate beams being adapted for support of the intermediate beams on the crossbeams; and
- spacing features fixed on at least some of the crossbeams and co-operating with the intermediate beams for evenly spacing the latter between the edge beams

characterised in that the support formations of the opposite edge beams are open, circular section grooves; and the end formations of the crossbeams are have spherical ends, sized to fit the grooves.

Normally the crossbeams will be of uniform length, whereby their angle with respect to the edge beams is determined by the separation of the edge beams and they are maintained parallel.

Preferably, the grooves of the support formations may be supplemented by support lips abutting the underside of the crossbeams, particularly where the edge beams are not expected to rise and fall with respect to each other.

Preferably, the spacing features are cams fixed to the crossbeams and acting on the intermediate beams. Whilst it is envisaged that the cams may be fixed to the top of the crossbeams; in the preferred embodiment, they are fixed to the bottom of the crossbeams. The intermediate beams have apertures through which the crossbeams extend, with the cams acting on bottom portions of the intermediate beams.

To help understanding of the invention, a specific embodiment thereof will now be described by way of example and with reference to the accompanying drawing, in which:

Figure 1 is a cross-sectional side view of a bridge joint of the invention; and

Figure 2 is an underside view of the bridge joint of Figure1.

The bridge joint 1 shown in the drawings is set between two adjacent bridge roadway sections 2,3, which are liable to move by a small amount with respect to each other. The joint has steel edge beams 4,5 arranged across the roadway at the edge of the concrete C of the roadway sections. Each edge beam has a central section 6, which is generally square in cross-section, a horizontal flange 7, which is cast into the concrete and a vertical flange 8, which edges the concrete. The central section has a circular cross-section groove 9, which opens towards the gap G between the roadway sections and the opposite edge beam.

Cross beams 10 are regularly spaced along the length of the joint, i.e. across the width of the roadway. They are of square section mild steel tube, with a stainless steel sheath 12 to improve their bearing qualities. To each end of the crossbeams, a spherical steel ball 14 is fixed, as by welding or pinning. The balls are sized to fit in the groove 9. Thus the angle α which the crossbeams make with the edge beams is determined by the fixed length L of the crossbeams between the balls and the variable separation S of the edge beams. Whilst the edge beams remain parallel, the crossbeams will also remain parallel. To maintain the separation of the crossbeams, a number of spacer balls 15 is arranged in each groove 9 between each adjacent pair of crossbeam balls 14.

The crossbeams support a number, three as shown, of intermediate roadway beams 20. They are of general I-beam shape, with small grooves 21 in their heads 22. The edge flanges 8 of the edge beams also have such small grooves 21. Via these a diaphragm seal 23 is connected between each adjacent pair of roadway beams. These seals exclude water and dirt from the parts of the joint beneath them. The heads of the roadway beams provide the roadway surface between the concrete of the roadway sections 2,3. Feet 24 of the intermediate beams rest on the crossbeams. These transfer road loads to the edge beams via the balls 14 and lips 16 at the lower side of the mouth of the grooves 9.

To maintain the intermediate beams 20 evenly spaced, cams 17 are fixed to the underside of the crossbeams 10. They act against lower extensions 25 of the beams 20, the extensions being fitted to the beams after laying of them on the crossbeams. The joint is thus a coherent structure, which has a variable width. The cams are so shaped as to define a gap therebetween which is the same size as the thickness extensions 25, regardless of the angle α.

The invention is not intended to be restricted to the details of the above described embodiment. For instance the number of intermediate beams can vary. Since the intermediate roadway beams are stiff, the cams need not be provided on each crossbeam. The cams can be provided above the crossbeams, acting against the

webs of the intermediate beams, if there is insufficient space for them to act against the beams' feet.

CLAIMS:

1. A bridge joint for joining two sections of a roadway of a bridge, the bridge joint comprising:

- a plurality of roadway beams extending across the roadway and including:
  - opposite edge beams having support formations extending therealong, the edge beams being adapted to be fixed to respective opposite ones of the roadway sections and
  - intermediate beams;
- a plurality of crossbeams extending between the opposite edge beams,
  - the crossbeams having end formations which are complementary to the support formations of the edge beams,
  - the crossbeams being supported by engagement of the end formations with the support formations, whereby the crossbeams remain mutually parallel as the edge beams move with respect to each other, at least whilst the edge beams remain parallel and
  - the crossbeams and the intermediate beams being adapted for support of the intermediate beams on the crossbeams; and
- spacing features fixed on at least some of the crossbeams and co-operating with the intermediate beams for evenly spacing the latter between the edge beams

characterised in that the support formations of the opposite edge beams are open, circular section grooves; and the end formations of the crossbeams are have spherical ends, sized to fit the grooves.

2. A bridge joint as claimed in claim 1, wherein the crossbeams are of uniform length, whereby their angle with respect to the edge beams is determined by the separation of the edge beams and they are maintained parallel.

3. A bridge joint as claimed in claim 1 or claim 2, including a number of spacer balls arranged in each groove between each adjacent pair of crossbeam spherical ends to maintain the separation of the crossbeams.

4. A bridge joint as claimed in claim 1, claim 2 or claim 3, wherein the support formations include support lips along the edges of the edge beams, with the circular grooves being set in from the support lips, and the crossbeams have flat undersides bearing on the support lips.

5. A bridge joint as claimed in any preceding claim, wherein the intermediate beams are perforate, with the crossbeams passing through perforations in the intermediate beams.

6. A bridge joint as claimed in claim 5, wherein the intermediate beams have flat under-surfaces for bearing on the crossbeams and lower extensions including the perforations, and the crossbeams have flat topsides for supporting the under-surfaces of the intermediate beams.

7. A bridge joint as claimed in any preceding claim, wherein the spacing features are cams fixed to the crossbeams and acting on the intermediate beams.

8. A bridge joint as claimed in claim 6, wherein the spacing features are cams fixed to the undersides of at least some of the crossbeams and acting on respective opposite faces of the lower extensions of the intermediate beams.

9. A bridge joint as claimed in any preceding claim, wherein the edge beams and the intermediate beams have heads with laterally opening grooves, diaphragm seals engaged in these grooves extending between respective adjacent pairs of these beams.

10. A bridge joint as claimed in any preceding claim, wherein the edge beams and the intermediate beams are solid steel beams and the crossbeams are of tubular steel.

11. A bridge joint as claimed in claim 10, wherein the crossbeams are of mild steel, with stainless steel sheaths.

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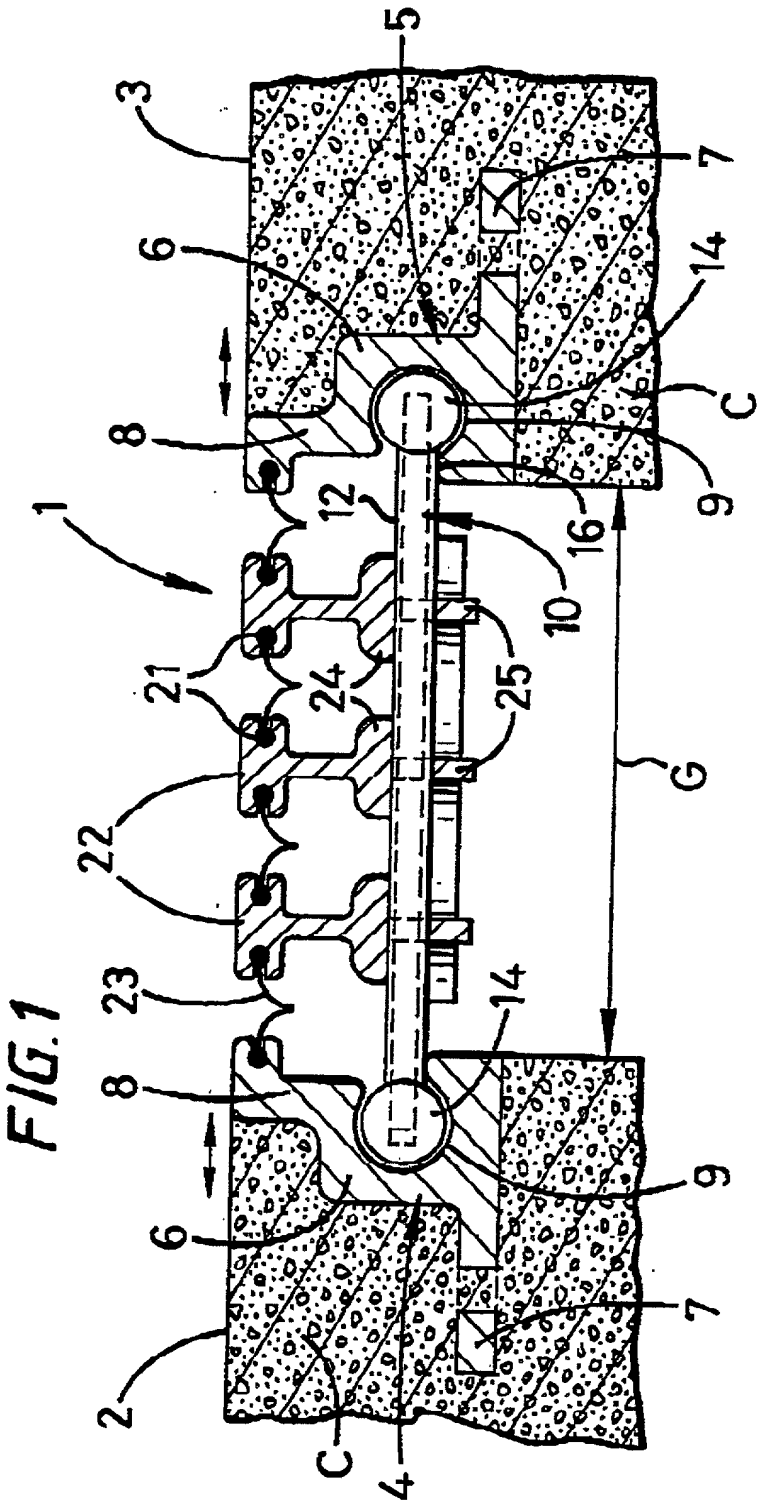

FIG.1

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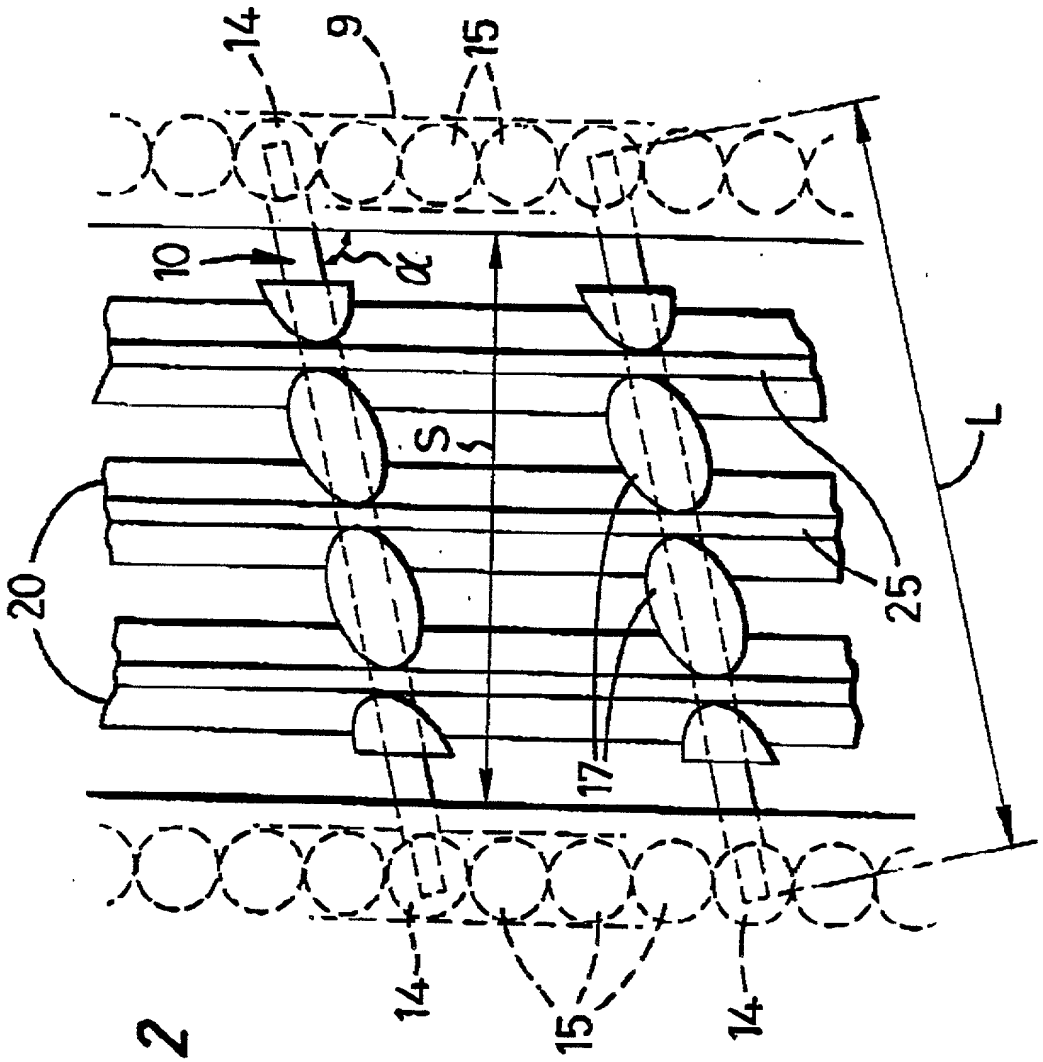

FIG.2